

Appl. No. 10/657,096  
Paper dated July 20, 2010  
Reply to office action dated January 21, 2010

**AMENDMENTS TO THE CLAIMS:**

This listing of claims will replace all prior listings of claims in the application.

Listing Of Claims:

Claim 1 (currently amended):      An integral, substantially air impermeable polymeric membrane for use in an electrochemical apparatus or process comprising:

- a) a polymeric sheet comprising polymer and having a porous structure with a microstructure of fibrils,
- b) the polymeric sheet having distributed in the polymer:
  - i) metal;
  - ii) an organic polymer; or
  - iii) a combination thereof, and
- c) said porous structure being at least partially filled with an ion-exchange resin to provide ionic conductance for use in the electrochemical apparatus or process,

wherein an interior volume of the porous structure of the polymeric sheet is substantially occluded by the ion-exchange resin.

Claim 2 (cancelled).

Claim 3 (original):    The membrane of claim 1 wherein the polymeric sheet has distributed therein a precious metal.

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Claim 4 (cancelled).

Claim 5 (currently amended):     An integral, substantially air impermeable polymeric membrane for use in an electrochemical apparatus or process comprising:

a) a polymeric sheet comprising polymer and having a porous structure with a microstructure of fibrils,

b) the polymeric sheet having distributed in the polymer:

i) inorganic particulate;

ii) metal;

iii) an organic polymer; or

iv) a combination thereof, and

c) said porous structure being at least partially filled with ~~an ion-exchange resin~~ electrolyte to provide ionic conductance for use in the electrochemical apparatus or process,

wherein the polymeric sheet has distributed therein fumed silica, and an interior volume of the porous structure of the polymeric sheet is substantially occluded by the electrolyte.

Claim 6 (original):   The membrane of claim 1 wherein the polymeric sheet has distributed therein titania.

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Claim 7 (cancelled).

Claim 8 (original): The membrane of claim 1 wherein the polymeric sheet has distributed therein platinum.

Claim 9 (original): The membrane of claim 1 wherein the polymeric sheet has distributed therein platinum supported on a substrate.

Claim 10 (currently amended): A polymeric membrane for use in an electrochemical apparatus or process comprising:

- a) a polymeric sheet comprising polymer and having a porous structure,
  - b) the polymeric sheet having distributed in the polymer:
    - i) metal;
    - ii) an organic polymer; or
    - iii) a combination thereof, and
  - c) an interior volume of said porous structure ~~being at least partially filled with~~ is substantially occluded by an ion-exchange resin to provide ionic conductance for use in the electrochemical apparatus or process,
- wherein the polymeric sheet is expanded porous PTFE, ~~and said ion-exchange resin fills substantially all pores of the expanded porous PTFE.~~

Claim 11 (cancelled).

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Claim 12 (original): The membrane of claim 1, wherein the polymeric sheet has metal distributed therein.

Claim 13 (original): The membrane of claim 1, wherein the polymeric sheet has an organic polymer distributed therein.

Claim 14 (original): The membrane of claim 1, wherein the polymeric sheet has a thickness of less than 50 microns.

Claim 15 (original): The membrane of claim 1, wherein the membrane is disposed between two fuel cell electrodes.

Claim 16 (canceled).

Claim 17 (previously presented): The membrane of claim 15, wherein the polymeric sheet has a thickness of less than 38 microns, and wherein the membrane that is disposed between said two electrodes of a fuel cell provides a steady state current of at least  $1.78 \text{ amps/cm}^2$  at 0.5 volts, with no humidification of incoming fuel cell air and hydrogen reactants, with air and hydrogen feed both at 40 psig and  $25^\circ\text{C}$ , and the fuel cell temperature at  $50^\circ\text{C}$ .

Claims 18-23 (cancelled).

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Claim 24 (previously presented): The membrane of claim 1, wherein said ion-exchange resin is fluorinated.

Claim 25 (previously presented): The membrane of claim 14, wherein the polymeric sheet has a thickness between 13 microns and 50 microns.

Claim 26 (cancelled).

Claim 27 (previously presented): The polymeric membrane of claim 1 in which the polymeric sheet comprises a porous polymeric film; and the ion exchange resin is a polymer different from the polymeric film.

Claim 28 (previously presented): The polymeric membrane of claim 1 in which the polymeric sheet has a porosity of 40% to 95%.

Claim 29 (previously presented): The polymeric membrane of claim 1 in which the polymeric sheet has a porosity of 70% to 95%.

Claim 30 (previously presented): The polymeric membrane of claim 1 in which the polymeric sheet comprises an expanded porous PTFE film having substantially fibrils with substantially no nodes present.

Claim 31 (cancelled).